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PLASTIC RECYCLING PROJECT

GUIDE FOR RECYCLING PLASTIC (PET) BOTTLES

This publication was produced for review by the United States Agency for International Development. It was prepared by the Plastic Recycling Project implemented by MDC-TI.NET.

The plastic beverage containers have become very popular over the last several decades. Their growing use offers a good opportunity for starting and expanding recycling efforts.

Recycling has become an important business segment. People all over the world have been seeking ways to extend the use of materials. The recycling gives the used materials a new function. This process has many advantages, including protection of the environment, preservation of the natural resources and creation of new jobs.

This guide has been designed to help municipalities, recycling coordinators and other interested parties design and implement successful programs for recycling plastic beverage bottles (PET bottles) at schools, workplaces, entertainment venues and special events.

The guide is organized in several sections, as follows:

1. Introducing PET - Background information about PET bottles and recycling.
2. How to Start a PET Recycling Program - Key steps for planning, initiating and managing a successful plastic bottles recycling program.
3. Recycling Tips for Venues - Additional recycling tips tailored to certain types of facilities, from universities to convention centers, sporting events to special events, and other major venues.
4. Resources for PET Recycling - Additional information that may be helpful to your recycling efforts.

The Plastic Recycling Project organized the preparation of this guide in an effort to start and expand PET recycling at major venues throughout the country.

The Plastic Recycling Project is sponsored by the United States Agency for International Development.

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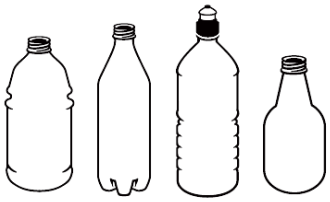
1. Introducing PET

PET (PolyEthylene Terephthalate) is a strong but lightweight form of clear polyester. It is used to make containers for soft drinks, juices, alcoholic drinks, water, edible oils, household cleaners, and other food and non-food applications. Being a polymer, polyethylene terephthalate's molecules consist of long chains of repeating units containing only the carbon (C), oxygen (O) and hydrogen (H) organic elements.

PET was first developed for use in synthetic fibers by British Calico Printers in 1941. The patent rights were then sold to DuPont and ICI who in turn sold regional rights to many other companies. Although originally produced for fibers, PET began to be used for packaging films in the mid 1960s and then, in the early 1970s, the technique for blowing bi-axially oriented bottles was commercially developed. Bottles now represent the most significant use of PET molding resins.



The making of a PET bottle starts from the raw material: ethylene and paraxylene. These two substances' derivatives (ethylene glycol and terephthalic acid) are made to react to obtain the PET resin. The resin, in the shape of small cylinders called pellets, is melt and injected into a mould to make a preform. The preform, a sort of test tube shorter than what the bottle will be but with thicker walls, is then blow-molded. During the blow-molding phase, high-pressure air is blown into the preform allowing it to take the exact shape of the mould it is set into.

The final product is a transparent, strong and lightweight bottle. It is the strength of the material that contributes to make PET the success it is. Indeed, carbonated soft drinks can generate pressure inside the bottle reaching up to 6 bar. Such high pressure however, thanks to the alignment of macromolecules (crystallization) occurring both during the resin spinning process and the blow-molding process, is not capable of deforming the bottle nor can it make the bottle explode.

Throughout the years, the **PET industry** has increasingly taken on environmental concerns, significantly decreasing the quantity of raw material needed for the manufacture of bottles. Nowadays, a 1.5 liter PET container is manufactured with just 35 grams of raw material!

PET bottles can be fully recycled!!!

It was in 1977 that the first PET bottle was recycled and was turned into a bottle base cup. Soon however, the fiber industry discovered the "new" material source and started using it for making textiles, carpets and non-wovens.

Today, even though the "bottle to bottle" recycling process is growing, the fiber market is still the major outlet for recovered PET.

The main reasons lying behind the success of PET containers is that, thanks to the molecular structure of the material set into a web, it is unbreakable. What is more, PET packaging is lightweight, transparent and re-sealable. Another advantage of the material lies in its physical properties that allow for great freedom in design.

PET containers are 100% recyclable. However, it is not only their recyclable quality that makes them environmentally friendly. Being extremely light, they help diminish the formation of packaging waste while at the same time they reduce the emission of contaminants during their transport. Furthermore, since they require less fuel during transport, they also help saving energy.

In order to give birth to a new product, used PET containers must first and foremost be collected. Nowadays, the majority of European cities have set into place a collection scheme to recover recyclable items. The second step into recovering used PET bottles entails collected material to be sent to a sorting plant where materials are separated according to their nature.

Recovered PET bottles are then punctured and baled (that is: compacted in a bundle) and are sent to a reclaimer. The reclaimer, is a factory that turns used bottles into PET flakes, the raw material at the base of recycled PET products.

The first thing the reclaimer has to do is de-baling the bundles. To make sure the final product will be as pure as possible, the de-baled bottles are sorted once again then they are pre-washed and are shredded into flakes. The flakes are washed and dried in their turn, and then they are stocked and sold. It is when the flakes are sold that the actual recycling sets into action: the flakes, the raw material, are melted then manufactured into a new product.

In Europe only a few countries concentrate their collection program on the whole range of consumer packaging, rigid or flexible. The majority of the countries have plastic bottles targeted for collection, all including or even concentrating on PET bottles. This implies that large quantities of PET bottles are available for recycling. The good chain co-operation, the well organized collection and transport infrastructure, the availability of sufficient recycling capacity, the high quality of RPET (Recycled PET) and available outlets, as well as the positive eco-profile: all these aspect together make PET bottle recycling to one of the most successful examples of recycling of post-consumer household waste.

PLASTIC RECYCLING IS A WORK IN PROGRESS!

2. Starting a PET Recycling Program

This section of the PET Recycling Guide provides basic tools for creating an effective and efficient PET bottle recycling program. It covers the key elements for planning, establishing, and managing PET recycling.

The key elements of the PET Recycling Program:

1. **Planning activities**
2. **Assessment of PET waste quantities and structure on the venue**
3. **Analysis of costs and benefits**
4. **Identifying markets for the bottles**
5. **Collection, handling and processing**
6. **Evaluation and training of people**
7. **Promotional activities**
8. **Monitoring and program's evaluation**
9. **Continuous process' improvements**

The key conditions to the recycling success

- **Commitment** - Support from top management or lead event organizers, such as a policy statement, memo, funding, or direct involvement.
- **Collection** - An efficient, easy-to-use, consistent, and prominent collection system.
- **Participation** - Employees and attendees who are aware and supportive of recycling efforts.
- **Storage** - A holding area for combining recyclables collected from smaller containers for bulk pick-up.
- **Markets** - Including efficient transportation options and a processing system to ensure that the collected material is recycled.

2.1 Planning activities

Planning is the key for successful implementation of the recycling program. The key questions that arise before the planning starts are:

- **Who is going to assist with the planning?**
- **Who will oversee the program?**
- **How does the PET recycling fit into the waste management and recycling program?**

Whether you are starting a program from scratch or adding PET to your existing recycling program, planning is essential to its success. Planning for recycling at some special events should start years in advance, but it is never too late to start. The following tools can help plan for recycling programs at a variety of venues.

Tools for Planning:

- Involvement - Organize a Recycling Planning Committee to create partnerships and build support from key stakeholders, such as facilities management, administration, vendors, facility users, and recycling processors.
- Flexibility - Plan a program where you can expand recycling or modify your collection and processing to meet changing market conditions for recyclable materials.
- Contracts - Anticipate and meet recycling needs in employment agreements and contracts. Food and beverage vendors, waste haulers, and custodial staff can influence recycling success. Contracts can include provisions to support recycling by providing recycling bins or other financial and promotional support.
- Finances - Use an accounting system that captures savings from reduced waste disposal costs to help fund recycling efforts.
- Education & Training - Promote recycling and educate employees and attendees; teaching visitors and staff to recycle properly is essential to success.
- Goals - Set clear objectives to help focus on developing the key elements of an effective program; benchmarks let you evaluate the program's progress and results over time.

2.2 Assessment of the types & quantities of PET bottles

Before the PET recycling program starts, it is essential to carry out an assessment of the types and quantities of PET bottles used at your venue.

key questions:

- **How many PET bottles are used at your venue?**
- **What kinds of beverage containers are available at the site?**

Depending on the beverages available at your venue and the drinks people bring with them, you can expect to generate different kinds of recyclables. The quantity of PET at your location will depend on a number of factors:

- Amount of beverages sold on-site in PET bottles versus other containers (aluminum, glass, or cups)
- Number of people at the location

- Type of activity or event
- Other factors, such as availability, policies on bringing outside drinks, and hot weather

The annual consumption of PET for packaging in Macedonia, i.e. the waste generated from PET, is estimated at 10,000 tons. This number was reached by independent researches. The increase of PET use is estimated at 5 - 10% on an annual basis.

2.3 Analysis of costs and benefits

The successful PET bottles collection and recycling program depends on the economic viability of the process.

key questions:

- **What are the benefits of PET recycling?**
- **What are the costs to recycle PET?**

While recycling has broad support as the right thing to do, it can be challenging to start a program if handling recyclable materials costs more than current methods of solid waste disposal. However, recycling has the potential to provide an economic benefit, as well as a social and environmental advantage, to your facility.

Assessing the economics of PET recycling requires examining both the benefits and the costs of recycling efforts. These benefits and costs should be quantified to the extent feasible, but also keep in mind that recycling programs often have benefits, such as resource conservation, that are not easily quantified.

Direct Benefits

- Avoided costs of waste collection and disposal (including materials and labor).
- Extended lifetime of the landfills.
- Potential revenue for PET bottles.
- Reduced litter and avoided clean-up costs.

Recycling Costs

- Labor costs (beyond existing solid waste handling and disposal).
- Collection bins (Recycling bins can be rented, purchased, or sometimes obtained for free or in exchange for advertising rights).
- Supplies for collecting PET, such as clear liner bags for recycling bins.
- Intermediate storage containers, if needed.
- Transportation to markets, if needed.
- Promotional and educational materials.
- Processing equipment, if needed (Typically only venues with high volumes of recyclables have the economics to support investing in major equipment such as compactors or balers).
- The benefits and costs of recycling at your facility will vary depending on a range of factors. Various organizations also offer grants for obtaining collection bins and assistance with other costs of starting an PET recycling program, and contracts with vendors can include provisions to offset recycling costs.

2.4 Identifying markets for the PET bottles

The markets for PET bottles have increased over the last decade.

key questions:

- **What are markets for recycled PET?**
- **What are the market requirements?**

There are two basic types of markets for the PET bottles:
- Consolidators - They are involved in collecting PET bottles from various places for the purpose of accumulating material at one place. Usually, they carry out simple processing activities, such as baling. They sell the PET bottles to reclaimers, brokers and end users.
- Reclaimers, brokers and end users.

2.4.1 Consolidators

- Local small merchant, communal company (public of private), non-profit organization, scrap dealer
- May already be collecting the trash or recycling at your location
- Will pay or charge for materials based on the quantity and quality, how it is prepared, and current market prices
- May pick up materials or may require delivery
- May provide intermediate storage containers or receptacles (and may require
- their use)
- May sort and bale materials for sale to a reclaimer, broker, or end user

Questions to ask haulers or processors
- Will they accept loose (unbaled) material?
- Will they accept mixed or unsorted (commingled) cans and bottles?
- What contamination level are they willing to accept?
- Are there any restrictions (e.g., caps need to be removed, liquids emptied, etc.)?
- Will they pick up the recyclables at your venue?
- Do they buy PET bottles, or do they charge to process them?
- Do they supply recycling collection containers? What kind and at what cost?
- What are the end users?
- Can you have a tour of the facility?
- Can they provide data on how much PETand other materials are being recycled?

2.4.2 Reclaimers, Brokers & End Users of Recyclables

- Both local and national
- Large quantity buyers (by the truckload)
- Will often negotiate on transportation fees
- Require PET to be sorted and baled to meet their specifications

2.5 Collecting, handling and processing PET

There are numerous ways to set up an effective PET recycling program. The success depends largely on the ease of use for the public and an efficient system for collecting and processing the recyclables.

key questions:

- **What is the collection method?**
- **What type of collection bins will be used?**
- **How will the bottles be handled and processed?**
- **What equipment is needed?**
- **Collection Strategies**

A fundamental decision that every program faces is how PET will be collected - that is, whether PET will be collected in its own separate containers or in bins with other recyclable materials.

How you collect the PET will affect how much material you'll need to handle or process before it goes to market. Collection strategies need to meet the demands of desired markets efficiently.

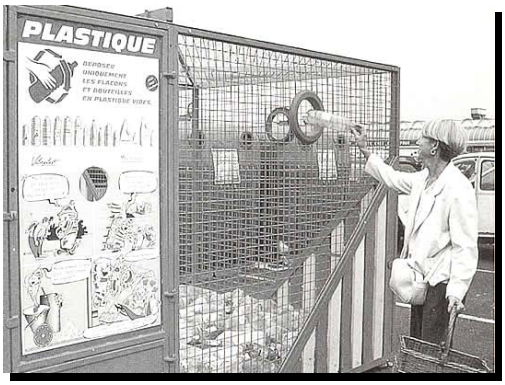
When designing your collection strategy, consider the ease of use for the public and staff as well as the markets that can take your recyclables.

2.5.1 Tools for Collection

Experience from other countries has shown that high recovery and low contamination rates are typically found in programs that use the following methods.

1. **Collect PET in commingled bins labeled "Cans & Bottles" Or collect PET alone, in bins labeled, "Plastic Beverage Bottles Only"**
    - Make certain to consider handling and processing procedures as well as markets to determine which system will work best at your venue. Even a source-separated system may need additional sorting, and a commingled system may increase recovery of recyclables.
    - Cups create a high risk for contamination from other plastic types - such as polyvinylchloride (PVC #3) or polystyrene (PS #6). Cup colors, anti-stick coatings, and leftover drinks can also contaminate recyclables.

2. **Make recycling bins easy to identify and use properly.**
   - Put simple, explicit signs and labels both on and near the recycling bins. Icons of bottles will reinforce the message.
   - Choose recycling bins that are visually different from other waste bins. If possible, use consistent styles, colors, and labels throughout your facility.
   - Use see-through containers and bags for collecting recyclables inside the bins.
   - Include bottle-sized holes in the tops of containers, and clearly label the container near the opening with your recycling message.
   - Don't change the program too often, unless it is essential for improving its success. It usually takes time for people to change their habits.



3. **Locate recycling bins next to all garbage bins to encourage people to recycle when they are disposing of their beverage bottles.**
   - Recycling bins located away from garbage cans may be mistakenly used as trash bins.
   - If placing recycling next to each garbage can is not feasible, locate recycling bins with garbage bins in the highest traffic areas. Add more recycling bins over time.
   - People normally consume their beverages and dispose of the containers away from the place where they bought them, so plan your recycling locations accordingly.

4. **Service the recycling collection bins as they fill.**
   - Check your collection bins periodically for contamination. If the bins collect waste and overflow, they are more likely to be used as trash bins.

2.5.2 Collection Containers

You may want to select different bins for outdoor or indoor use, in offices, or for temporary events, but it is important to choose the right locations and maintain consistency throughout the facility. In general, the public responds best to a program where the bins and signage are consistent and where recycling bins are always placed with garbage bins.

2.5.3 Collection Logistics

Efficiency is the key to a cost-effective recycling program. Minimizing your handling of the material will help reduce your program costs. Integrating the collection of PET into your current solid waste or recycling collection system can also help.

Tools for Improving Collection Logistics:

1. Have existing custodial or janitorial staff participate in collecting recyclables and delivering them to a central location for each building or area.
2. Use clear plastic bags as liners for bins.
    - Minimizes heavy lifting needed to empty unlined bins.
    - Reduces the need for frequent cleaning of bins.
    - Allows for identification and removal of contaminants.
    - Keeps bin contents visible and easy to identify. Putting garbage in opaque black bags makes it visibly distinct from recyclables.
3. Consider using pick-up vehicles with separate compartments or trailers for garbage and recyclables, tailored to your program. Modified flatbed trucks, trailers, or golf carts can work well for collecting recyclables. Some programs have been able to work with their beverage vendors for transportation assistance.

2.5.4 Storing Recyclables

Whether a hauler collects your PET or you transport it to a facility, your program will incur pick-up or transportation costs. Stockpiling recyclables can reduce the frequency of hauling or pick-up and minimize costs, but it requires storage containers or facilities.

Tools for Storing Recyclables

1. Store PET bottles on-site to limit how often you or your hauler needs to transport material to the processing facility.
2. Bulk storage containers are available in various sizes and prices.
3. If your facility has limited space for storage containers, consider storing recyclables in bags at a loading dock or creating a fenced-in “corral” for bagged bottles.

2.5.5 Handling & Processing PET

Regardless of the collection system you choose, some handling and processing is necessary before PET can be sold to end markets - the manufacturers that use recycled PET to make new products. Many venues will lack the sufficient quantity or capability to process PET for sale directly to these markets. Instead, these programs will use haulers and processors to handle PET. (In turn, haulers and processors sell the processed recyclables to end users.)

The amount of handling and processing your program conducts will depend on your local options, the amount of PET the facility generates, and the collection system.

2.5.6 Preparing PET for Haulers or Processors

Haulers or processors will handle and process loose, commingled recyclables or source separated PET for sale to end markets.

Facilities that collect PET and use haulers or processors to handle the material shouldn't need to do much on-site handling or processing.

Haulers and processors may or may not charge for their services - or they may provide payment for the recyclables - depending on market pricing and agreements.

Tools for Using Haulers or Processors

1. Work with your processor to organize a collection program that limits the amount of handling you are required to do, while still providing a high recovery rate and perhaps a payment or rebate.
2. If possible, shop around to find a market that will accept the materials with no prior processing.
3. Consider delivering PET directly to the processor. Some processors will pay more for PET if delivered.

What level of processing is appropriate?

Sorted and baled recyclables in large quantities bring the highest market value. However, many venues and events do not generate enough PET or other recyclables to justify the equipment and labor needed to prepare the material for end markets. Most venues use haulers and processors to prepare the materials, and these recycling programs minimize their costs by limiting the handling of materials.

2.5.7 Processing for End Markets

If you have sufficient quantities of recyclables to process materials on-site and market them directly to end users, it may be cost-effective to invest in a small materials recovery facility, or mini-MRF. While designing the program, keep the following issues in mind.

Tools for Processing for End Markets

1. Markets will fluctuate. Flexibility to separate and process materials by type can increase your return on investment and enable you to meet different market requirements, but it will not guarantee a "profit."
2. Equipment that handles more than one commodity can improve your investment. For example, if you have enough recyclables, you could buy a baler that processes both PET and corrugated cardboard.
3. You can maximize processing efficiency by investing in equipment, including the following items
    - Sorting system
    - Perforator
    - Baler
4. Sorting can be done in different ways, using either "negative" or "positive" sorts. A negative sort involves removing unwanted items (such as cups) from a mix of materials, while a positive sort entails selecting specific materials (such as PET bottles). A processing system may involve both types of sorting.

2.6 Educating and training staff

Education and training of the staff and volunteers that support your recycling program are both crucial to successful recycling efforts.

key questions:

- **What methods will you use to educate and train staff in your recycling program?**
- **How often will training occur?**

Experience shows that recycling is easier, and problems are minimized, when proper education and training are provided. Proper training helps maximize the amount of PET recovered and minimizes contamination.

Tools for Staff Education & Training

- Involve program staff in the planning process. Such involvement helps employees take ownership of the program and gives them a stake in making it a success.
- Ongoing staff training sessions and orientations for new staff should include discussion of the recycling program.
- Training should be as specific as possible and include clear examples of what to do and what not to do when collecting and handling recyclables. Make sure custodial staff know where to put materials to avoid contamination or inadvertent disposal of recyclables.
- Complement your written policies, manuals, and instructional signs with hands-on training. Signs may need to be printed in several languages.
- Involve staff in deciding where to place bins, what signs to use, and how to collect recyclables most efficiently.
- Prepare “recycling report cards” for buildings or locations to provide feedback on success and stimulate healthy competition to increase recycling efforts.
- Adding recycling to garbage or litter collection activities is usually more effective than having recycling as a separate activity.

2.7 Promoting the Program

Having a simple and easy-to-use recycling system can educate users and create lasting behavior change. Simple signage that includes visuals and consistent color-coding of containers are key elements of such a program. Additionally, it is helpful to use many forms of advertisement and promotion to reinforce and enhance participation in recycling.

key questions

- **How will you publicize the program?**
- **How will you educate facility users?**

Tools for Promotion

- Use various media, such as public service announcements, buttons, posters, banners, and T-shirts to promote the recycling program.

- Include recycling information in press releases, flyers, or news letters about special events, environmental programs, or facility maintenance bulletins.
- Children may be especially interested in environmental efforts such as recycling, and age-appropriate messages can help encourage kids and their families to recycle.
- Ask vendors to wear buttons or stickers publicizing the recycling program.
- Sponsorship from a beverage company or local business will reduce publicity costs, increase the amount of publicity, and involve the private sector in your recycling effort.
- Solicit donations and in-kind services, and seek to address your specific needs if businesses or organizations offer to help.
- Prizes or recycling competitions may help in the short term, but they are less effective for achieving long-term results or education.
- Polls, focus groups, or other methods can provide information about the attitudes and behaviors of facility users. This information can help you tailor effective messages for educating users and promoting recycling.
- Use creative approaches to raise awareness about PET recycling. For example, stage a fashion show that highlights products made from recycled plastics.

2.8 Monitoring & Evaluating the Program

In starting a recycling program, defining a system for monitoring and evaluation early in the process will help determine its strengths and weaknesses. You can also measure any changes in recycling over time. Measuring how much is recycled helps calculate program costs and savings on avoided trash collection and disposal fees.

key questions:

- **How will you monitor and evaluate the program?**
- **How often will you monitor and evaluate?**

Proven high levels of recovery can help maintain strong support from top management, markets, and cooperative vendors. You can use various methods to monitor the success of your PET recycling program, and you should consider using multiple evaluation tools.

- Statistical measurements
- Diversion rates
- Financial analysis
- Qualitative measurements

Statistical Measurements

One way to determine whether PET recycling is increasing at your facility is to sample materials from various recycling bins and measure changes over time. To maintain consistency and statistical validity, the same bins should be compared to each other throughout the study.

Diversion Rates

The diversion, or recycling, rate indicates how much material is recycled, compared to the total amount disposed and recycled. The diversion rate is calculated using the following formula:

Recycling rate = Amount Recycled / (Amount Recycled + Amount Disposed)

The recycling rate is expressed as a percentage, while the recycled and disposed numbers are typically expressed as tons, pounds, or cubic yards. You can use a Waste Sort, such as the simple one described on page 41, to determine the quantities and recycling rate.

Financial Analysis

To sustain the program over time, PET recycling should achieve the lowest possible cost per ton or cubic yard of material recovered. Success depends on both maximizing the amount recovered and minimizing the costs to do so. Implementing a recycling program without maximizing its capacity will result in a costly, ineffective program that won't achieve the desired results over the long run.

Sharing the costs of collection with the solid waste management system will reduce recycling costs. Encouraging the public to contribute their time and effort by placing PET bottles in the correct bins is a key ingredient of financial success. Recycling bottles removes them from the waste stream and reduces the volume and weight of trash disposed - a sizeable benefit that accurate measurements and assumptions can help quantify.

Conducting a waste audit before initiating the recycling program will provide benchmark figures for comparison. Frequent evaluation of costs and benefits can provide information to troubleshoot problems, improve recycling logistics, increase recovery, and reduce costs.

Qualitative Measurements

Qualitative measures offer another way to gather information about how well your recycling program is working. The following examples illustrate some methods for qualitative review.

- Observe the program in action. Walk around the facility, and talk about the program with both the people who recycle and those who do not.
- Conduct impromptu sorting of individual recycling bins. Note which bins contain most contamination, and use the results to improve educational messages or relocate bins.
- Talk with the recycling crew about how well they think the recycling program is working and what level of contamination they believe exists. Evaluate the motivation level of the recycling crew.
- Review any media accounts of the program to see if it receives positive publicity for both environmental benefits and cost savings.
- Ask staff and visitors about their level of satisfaction with the recycling program and solicit their suggestions for improvements.
- Evaluate the performance and responsiveness of recycling haulers.

3. Recycling tips for various venues

Designing the right program for recycling PET depends on the facility and the people who use it. For each venue type, this chapter highlights additions to or differences from the standard practices outlined in the previous chapter. Accordingly, the topics covered for each venue vary, depending on what's most relevant to the facility.

1. Schools & School Districts
2. Colleges & Universities
3. Stadiums & Arenas
4. Corporate & Institutional Complexes
5. Amusement Parks & Zoos
6. Convention & Conference Centers
7. Special Events, Festivals & Fairs

Because venues in different categories may share some characteristics, you may also find it useful to review the sections for other venues with similar facilities or functions.

If your venue type is not included here, think about the types of activities that take place at the facility and try to find the categories that are most similar.

3.1 Schools & School Districts

Schools and school districts often have high rates of soft drink consumption. The educational environment can offer an excellent opportunity for innovative ways to boost recycling.

Planning

- Form a "Resource Conservation Team" - including your recycling hauler or processor, teachers, office staff, custodians, vendors, and students - to assist with planning and streamline communication.
- Science or environment clubs are often useful groups to involve in recycling efforts.

Collecting, Handling & Processing PET

- Schools often need dedicated storage areas for collected bags of recycled bottles.

Educating & Training Staff

- Teach the custodians about recycling as part of their regular training sessions at the start of the school year, and include recycling specifics in the employee handbooks.

Promoting the Program

- Have a poster contest between classrooms, or have each classroom or school decorate signs for PET recycling bins.
- Have teachers make announcements about the PET recycling program or incorporate recycling topics into their lesson plans.

3.2 Colleges & Universities

College and university campuses usually include numerous types of buildings and facilities, such as residence halls,

offices, classrooms, sports facilities, research labs, libraries, and dining halls. Beverages are distributed in a variety of ways, and vending machines are usually common. Drinks are also brought in from off-campus.

Planning
- Include provisions to support PET recycling in contracts with vendors and bottlers.

Collecting, Handling & Processing PET
- Recruit students to help. They are often active volunteers in supporting recycling efforts. Work-study students can also collect or sort recyclables in a cost-effective manner.
- Some campuses are large enough to manage their own processing facilities effectively and efficiently.

Promoting the Program
- Include recycling information in the orientation for new students as well as university publications, such as campus newspapers, newsletters, and websites.
- Use campus groups and special events, such as Earth Day to help promote the recycling program.
- Create a website to provide students, staff, and faculty with convenient access to information on what, where, and how to recycle PET and other materials.

3.3 Stadiums & Arenas

Stadiums and arenas draw large crowds for their events. Unlike special events, these facilities have permanent infrastructure and typically host major events, such as games or concerts, on a regular and often frequent basis.

For many attendees - even those who wouldn't think of littering elsewhere - it is customary to leave drink containers, food trays, and other trash at their seats, rather than carrying the waste to garbage or recycling bins. As a result, these venues often need special clean-up crews for the seating area. Since glass is usually forbidden, PET is becoming a popular alternative.

Collecting, Handling & Processing PET
- Entrances and exits are common locations for recycling and garbage bins, but it is also helpful to include bins in or near the seating area if possible.
- Use staff or volunteer groups to collect PET and other recyclables from the seating area during the event.
- Conduct "sweeps" to collect PET and other recyclables (see sidebar).

Promoting the Program
- Use the public address system, reader board, or display screen to promote recycling during the event. Show a picture or video of someone, especially a player or local celebrity, using the recycling bins along with a recycling message.
- Ask vendors to include the recycling message in their concessions publicity.

3.4 Corporate & Institutional Complexes

Employees at major corporate or institutional locations often bring beverages from home or buy them on or near the work site. Large employment complexes often have cafeterias or vending machines that may sell beverages in PET bottles. Some companies also offer free soft drinks or juices as an added perk.

Collecting, Handling & Processing PET

- Lunch rooms, break rooms, or cafeterias are good locations for recycling bins.
- Providing each workspace with desk-side bins for PET and other recyclables helps increase recovery rates.
- Integrate PET recycling into your institutional program to maximize your cost savings. For example, if you are a manufacturing facility, you may already have baling equipment available for your other recyclables.

Promoting the Program

- Using a color-coded system in an institutional setting with long-term employees can create lasting recycling recognition.

3.5 Amusement Parks & Zoos

Visitors go to zoos, theme parks, and other amusement parks to have a good time, and families with children represent many of the attendees. Typical visitors spend much of a day at these locations, and their visits usually include some eating and drinking. Many of these facilities prohibit glass containers, making PET the bottle of choice for vendors and visitors.

Collecting, Handling & Processing PET

- Place recycling bins with all garbage containers, and check them frequently.
- Locate bins strategically. Remember that people in these entertainment venues are unlikely to walk out of their way to recycle their beverage containers.

Promoting the Program

- Team with volunteer groups to promote recycling, especially on special occasions such as Earth Day.
- Use signature logos for your zoo or park to make recycling signage more eye-catching.

3.6 Convention & Conference Centers

These venues can draw hundreds or thousands of attendees to events. Exhibits are usually placed and removed within a few days, but food and beverage vendors are often long-term.

Planning

- Involve general management and staff; their support is essential for making the recycling program run smoothly.

Collecting, Handling & Processing PET

- Have staff members monitor recycling bins for contamination and empty them as needed.
- Have bins available in meeting rooms, for receptions, and for special events in the facility.

Educating & Training Staff

- Create recycling guidelines for staff and incorporate them into training sessions.

Promoting the Program

- Include recycling information in all marketing packets sent to potential exhibitors.

3.7 Public Multi-use Complexes

Public multi-use complexes contain a number of different venues within a single large location. With their diverse functions, these facilities are almost like small cities, but their attendees are highly transitory. These complexes may include meeting rooms, amusement rides, stadiums, restaurants, food courts, concert halls, theaters, retail stores, and hotels or resorts. The facility management at these venues is complex, and the use of PET bottles can be high.

Collecting, Handling & Processing PET

- Make recycling signs and labels as prominent as possible. If possible, use distinctive logos for your stadium, restaurants, and other facilities.
- Service recycling bins in restaurants separately from other public locations due to potential food contamination.
- Place recycling containers strategically, and keep in mind that visitors to your public event venues are unlikely to go out of their way to recycle materials.

3.8 Special Events, Festivals & Fairs

Special events are usually entertainment-oriented and often draw large crowds. They typically take place over one or several days, and many are annual events. Many special events - such as street fairs, concerts, athletic events like runs and bicycle races, and music festivals - are held outdoors.

Some special events take place at established facilities with existing infrastructure, such as fairgrounds or racetracks. These events may require supplemental collection containers and other facilities to support recycling, but they often already have some basic infrastructure, such as garbage cans, restrooms, and seating.

Other events occur at completely undeveloped sites where all infrastructure must be set up before the event and later removed - including portable restrooms, food service facilities, lighting, as well as waste disposal and recycling facilities.

Planning
- The recycling coordinator should be intimately involved in all aspects of event planning.
- Recycling provisions should be included in contracts for food and drink vendors as well as other booths.

Collecting, Handling & Processing PET
- Have staff or volunteers monitor the bins throughout the day and remove any contamination, so that the public does not mistake the recycling bins for garbage cans.
- Have staff or volunteers use litter collection pokers to remove trash from recycling bins.
- Have cleaning crews separate recyclables while collecting trash after the event.
- At venues with existing equipment and staff for solid waste collection, some events have reported high recycling rates using a separate collection system for reclables, rather than integrating recycling into the existing solid waste management.
- Recycling crews are typically dedicated to their program's success, while regular maintenance staff that have previously collected only garbage may view recycling at special events as an added burden.

Educating & Training Staff
- The recycling or event coordinator should talk to each vendor or booth before the event to show them where and what to recycle.

Promoting the Program
- Partnering with a large business in your area can help leverage resources. For example, you can ask the company to provide or pay for some bins in exchange for giving free publicity.

4. Resources for PET recycling

4.1 Where Does Recycled PET Go?

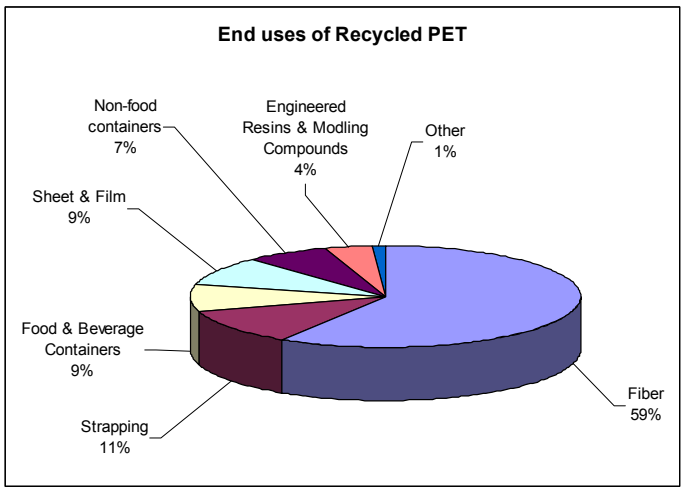
In designing an educational program about PET recycling, you may wish to include information on what happens to PET when it is recycled. This section describes the markets and uses for recycled PET.

Reclaimed PET plastic resin from PET bottles can be recycled into a number of new products. As you might suspect, some recycled PET is used in the production of new food and beverage containers, while other PET is used to make carpeting and clothing.

After collection in various recycling programs, post-consumer PET bottles go through a comprehensive recycling process before entering the end market for any of these new uses. This process includes contaminant separation, usually employing a combination of optical and density separation technology. Shredded flakes of PET are washed and dried, before the resin is melted down and sent through a melt filtration process to remove any remaining impurities. Many markets will blend post-consumer resins (PCR) with virgin plastic resins to minimize the impact of any physical differences in the recycled material.

Today, nearly 60 percent of the total PET bottles are made into polyester fiber. Recycled PET fiber can be used in a wide range of products, ranging from T-shirts to

fiberfill for sleeping bags. If you'd like to know where recycled PET goes, consider the following the facts:



- 12 PET bottles yield enough fiber for an extra large T-shirt, one square foot of carpeting or enough fiberfill for a ski jacket.
- Half of all polyester carpet manufactured in the U.S. is made from recycled plastic bottles.
- It takes 60 PET bottles to make a sweater.

4.2 How to Conduct a Simple Waste Sort

Determining the amount of PET at your facility can be an educational project for a recycling coordinator, recycling committee, or volunteer group. Some universities have turned waste sorting projects into learning activities or special events, such as for Earth Day. Organizing a waste sort can be relatively simple, and these "trash bashes" provide great hands-on experience for participants.

1. Collect bags of waste from throughout your facility. Try to obtain a representative sample from different trash cans. (To make the job less messy for your sorters, you should avoid kitchen or restroom waste for this exercise.)
2. Assemble bags of "clean" garbage to be sorted at an appropriate site.
3. Provide enough separate containers to hold the material you will be sorting.
4. Provide the participants with protective gear, including coveralls, gloves, and eyewear.
5. Weigh the bags of material prior to sorting.
6. Empty the bags into containers to estimate the total volume of the waste.
7. Sort the material into recyclables and garbage using a chart similar to the following one. You can tailor the categories to suit your facility. For example, you may wish to categorize PET bottles by color (clear, green, blue, amber, etc.).
8. Weigh the recyclables as well as the remaining waste. Weighing the materials more than once can reduce measuring error.

Paper		Weight	Volume
	Newsprint		
	Corrugated/Kraft, Unwaxed		
	Mixed Low Grade		
	Other Paper		
Metal			
	Aluminum Cans		
	Tin Food Cans		
	Other Metal		
Plastic			
	PET Bottles		
	Other PET Bottles, larger sizes		
	HDPE Bottles		
	Other Plastic		
Glass			
	Glass Beverage Bottles (clear, green, brown)		
	Other Glass		
Other			
	food Waste		
	Pallets		
	Non-recyclables		

4.3 Consolidators and Reclaimers in Macedonia

The following is a limited list of haulers, processors and reclaimers for PET in Macedonia:

-Agropal, Tetovo
-Agrostandard, Skopje
-Eko-Eras, Veles
-Ekopet, Skopje
- Provavil, Skopje
- Soncev Rid - Rajkovac, Kratovo
-TONI DEJ, Kumanovo

Check for your local hauler, processor or reclaimer.

For more information contact the Plastic Recycling Project.

USAID - PLASTIC RECYCLING PROJECT
29 Noemvri br. 50 1000 Skopje Makedonija

Tel. + 389 2 3246 794, + 389 2 3246 632
Fax: + 389 2 3246 796
e-mail: petrec@mt.net.mk